Cloud Computing Implementation in Indonesia

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Abstract

Cloud Computing is one of the emerging technology in the world of information technology. Technology acceptance model is strongly influenced by the recommendations of the decision makers in companies, which are influenced by their perception of new technologies. In this research will be discussed what factors are associated with significant recommendations of use of new technologies. The research was conducted by sending questionnaires to 400 companies; to the decision makers in the company. There are 180 companies has provided the answers. Based on the analysis results, there are several factors that influence decision making namely needs factors, cost effectiveness, security and the reliability the technology to be implemented

Keywords : Cloud Computing, Technology Acceptance Model, Information System

1. Introduction

In recent years, development occurred very rapidly in the computers implementation for business and education requirements. At the same time, the development of the internet with Web 2.0 will open the competition in global markets. The combination between the computers use enhancement and the internet enhancement, encouraged the use of resources as cheaply as possible. One of the solution from this problem is cloud computing. Cloud computing is a system of parallel and distributed computing which are consists of multiple computers connected to virtually displayed to one or more resources that can be used by consumers, agreement with service providers (Buyya, 2009). In addition, cloud computing is a model providing access to the computing resources collection which match and can be implemented easily without much intervention from service providers. The perception of security technology, effectiveness, reliability, and also the cost effectiveness needs become important elements in someone's decision to recommend the technology on its organization (Robert & Pick, 2004).

Based on survey by Springboard Research 2011, the development of the use of cloud computing in Singapore has reached to 29%, in Malaysia 27%, Korea 55%, whereas in Indonesia only 20%. It has suggested that there is still a great potential to develop cloud computing in Indonesia. By getting factors which influences the technology adoption within a company, the technology service providers will find a large or small possibility of cloud computing technology implementation which can improve company performances. Besides, it can be used as an evaluation of head company in order to increase the IT system in the company.

Cloud Computing can be applied for daily activities where used an online computer applications. Users do not need to buy application because it has served in internet (Katzan, 2009). Cloud Computing Support Technology consists of virtualization technology, Web 2.0, Grid Computing and Data Distributed Storage System (Velte, Velte, & Elsenpeter, 2010). Advancement of Cloud Computing System, has encouraging businesses to take advantages of the technology (Marston, 2011). In addition, advancement of Cloud Computing System has supported creations of Virtual Organization (VO) (Liu, Sia, & Wei, 2008). Applying Cloud Computing is not the same with outsourcing, because Cloud infrastructure authority will move to outside parties (Marston, 2011). Cloud Computing Architecture are consists of 3 supporting components, i.e Client, Data center, and Distributed Server (Velte, Velte, & Elsenpeter, 2010). In higher hierarchy of architecture, there are four components which are involved in providing Cloud Computing Service, i.e User, Service Level Agreement (SLA) Resource Alocator, Virtual Machine, and Physical Machine (Buyya, 2009).

In term of service provider, Cloud Computing Services divided into three model, i.e Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS) (Zissis & Lekkas, 2011). Main requirements of providing Cloud Computing services it should be eligible on Demand Self Service, Measure Service, and Rapid Elasticity Broadband Network Access.

In term of Economic aspects, Cloud Computing has taken advantages (Marston, 2011); decreasing first investation cost of computer system, treat IT cost as OPEX compared to CAPEX, decreasing limitation of IT innovation development, and facilitated adjustment services to costumers.

In term of technique aspects, Cloud Computing still has some risk (Paquette, Jaeger, & Wilson, 2010): i.e access could only give to the right users, availability of 100% service provider, without error, flexibility infrastructure, and scalability to support varied user.

Technology Acceptance Model (TAM) introduced by Davis (1986) has adopted Theory of Reasoned Action (TRA) adjusted model of user acceptance to information system. Primary purpose of TAM provides a basic to tract the impact of external factors on internal beliefs, attitudes, and intentions. TAM argues the two particular beliefs; Perceived Usefulness and Ease of use are main relevance to computer acceptance attitudes (Davis & Bagozzi, 1989).

TAM is a famous technology model on information technology acceptance research (Gahtani, 2001), and approved has an ability to explain desires and attitudes toward information system compared to TRA and TPB (Theory of Planned Behaviour). There are five steps in TAM to be proceed as an accepted technology innovation (Rogers, 2003), i.e knowledge about technology innovations, decision of utilize, applying technology, and confirm of applying technology innovation. In addition to the acceptance stage of technology, there are several factors that influences successful of the technology acceptance by the organizations, namely (Putnam, 1987): needs of the organization, cost effectiveness, reliability, and effectiveness technology. These four factors will be the focus in studies conducted.

2. Research Method

Research is a process of investigation systematically aimed for providing information to solve the problems (Zikmund, Babin, Carr, & Griffin, 2009). According to the classification, the research is divided into two types (Jollife, 2002): Exploratory Analysis is the research that found the characteristic/pattern of the data, and Confirmatory Analysis is the research conducted to test the hypothesis of a theory.

Because of the data retrieval is done by spreading the questionnaires to respondents, so that the data type used is the primary data. Dissemination of the questionnaire is carried out by sending email to the IT managers at 400 Indonesia companies. The results obtained from 108 respondents were specify as data of the research.The respondent were spread in six big cities in Indonesia, they are in percentages; Jakarta 64, Yogyakarta 8, Bandung 11, Batam 6, Surabaya 8, and Samarinda 3. The procentage of respondent work in companies; Manufacture 22%, IT/ telecommunication 56%, and others 22% ; 42% of them has been using cloud computing and 58% has not been using.

In this research, the data processing will be done by using factor analysis based on theory, based on theory of data sufficiency (Sheskin, 2000), the minimum number of respondents is 5 x variable. In this research, there are 16 variables, the minimum number of respondents identified is 80 people. Factor analysis is a multivariate statistical technique to analyze the internal relationship between the variables, so that it can be regarded as a linear relationship (Jollife, 2002). To test a data worth or not to be processed by using factor analysis, there are two things that need to be done, which are to determine the value of Barlett Test of Sphericity and and to determine the value of Keiser Meyer Okliti (KMO) Measure Sampling Adequacy. If the value of KMO more than 0,5 are hence the processing of factor analysis worthy to be done. In this study, the factor analysis done with *principal component analysis* and factor rotation of varimax. Principal component analysis used to reduce the multiple factors that are attached to some of the most significant factor. While the Varimax methods used to determine the weighting from each significant factor.

Based on research (Lease, 2005), there are several factors that influence the decision of the leader about the application of a technology, namely: security, reliability, cost effectiveness, and necessity. These four main factors are developed questions using Likert 5 point scale as the measurement data. Reliability testing questionnaire which is being spread out has been done by using Cronbach Alpha method. The test results is obtained by the questionnaire data value of Cronbach Alpha 0.926, which means the questionnaire is very reliable.

3. Result And Discussion

Each questionnaire includes of 15 questions and 1 question which is the question of the recommendation of the use of Cloud Computing Technology. These 15 questions then will be reduced to be a few factors by using PCA. Before processing with PCA, it also needs to test by Barlett Test of Sphericity to see a significant correlation between components that are tested, as well as testing Kaiser-Meyer-Olkin (KMO) Measure Sampling Adequacy is to determine the data sufficiency before it is processed by using PCA.

The results testing of KMO is 0.758 and Barlett significance Test is 0.0000 meaning can be proceed to the PCA (Table 1). The qualified components worth to be extract is by having eigen values > 1, Percent of Variance Extracted 75-80%, and Examination of Scree Plot. From those qualifications, it is obtained four components will be extracted to the PCA.

The results of the extraction process create four possible components representing each of the factors that influence the decision making (Table 2). From four of the components produced by the extraction, afterwards is carried out by the testing of the correlation to the question of recommendation. The testing of the first correlation is carried out between the "Need" component and the component of "Recommendation". The result of the first testing are at Table 3

From the Test table Correlation (Table 3), see that the value of the F Test 12.197 and the value of Significance 0.000 of less than 0.05 so that there is a significant correlation between “Need” component with Recommendation” component.

The second testing done between the "Cost" component and the "Recommendation" component, and results of the ANOVA calculation, value of F Test is 13,199 and the Significance value is 0.000 that was smaller than 0,05 so that there is significant correlation between the "Cost" component and the "Recommendation" component in Table 4.

The third testing done between the "Security" component and the "Recommendation" component, and the results of the ANOVA calculation , value of F Test is 15,600 and the significance value is 0.000 that is smaller than 0,05 so that there is significant correlation between the "Security" component and the "Recommendation" component in Table 5.

The last testing done between the "Reliability" component and the "Recommendation" component, and results of the ANOVA calculation, value of F Test is 13,100 and the Significance value is 0.000 that issmaller than 0,05 so that there significant correlation between the "Reliability" component and the "Recommendation" component in Table 6..

From the analysis results, showed that the four components in the extract of the questionnaires showed a significant relationship with a factor of Cloud Computing Technology usage recommendations. Thus, the recommendation of the use of Cloud Computing technology depends on the perceptions of decision makers in the companies surveyed which are the factors of Need, Cost, Security and Reliability.

4. Conclusion

According to the results of data analysis questionnaire, obtained the conclusions; cost-effectiveness, security and reliability of the system will affect to the decision making implementation technology proved to be significant with regard to the recommendation of the use of Cloud Computing Technology. The significant Factors could be a significant input to the decision makers in taking decisions on the application of new technologies, especially in Cloud Computing. In addition, for service providers, these factors could be a significant input to improve the services provided to the progress of IT industry in Indonesia.

References

Buyya, R. (2009). Cloud Computing And Emerging IT Platforms : Vision,hype,and reality for delivering computing as 5th utility. *Future Generation Computer Systems* , 599-616. http://dx.doi.org/10.1016/j.future.2008.12.001,

Davis, F. D., & Bagozzi, R. P. (1989). User Acceptance of Computer Technology : A Comparison of Two Theoritical Models. *35* (8).

Gahtani, S. A. (2001). The applicability of TAM outside North America : An empirical test in United Kingdom. *Information Resource Management Journal* , 37-46.

Jollife, I. (2002). *Principal Component Analysis, Second Edition.* New York: Springer.

Katzan, H. (2009). Cloud Software Service : Concept, Technology, Economics. *Service Science* , 256-269. http://www.sersci.com/ServiceScience/upload/12567381160.pdf

Lease, D. R. (2005). Factor Influencing The Adoption Of Biometric Security Technologies By Decision Making.

Liu, C., Sia, C.-L., & Wei, K.-K. (2008). Adopting organizational virtualization in B2B firm : An Empirical Study in Singapore. *Information and Management* , 429-437. http://dx.doi.org/10.1016/j.im.2008.06.005

Marston, S. (2011). Cloud Computing - The Business Perspective. *Decision Support System* , 176-189. DOI: 10.1016/j.dss.2010.12.006

Paquette, S., Jaeger, P. T., & Wilson, S. C. (2010). Identifying the security risks associated with governmental use of cloud computing. *Government Information Quarterly* , 245-253. http://dx.doi.org/10.1016/j.giq.2010.01.002

Putnam, R. (1987). Selling modernization within your company. *COMMLINE* , 13.

Robert, K., & Pick, J. B. (2004). Technology Factor In Corporate Adoption of Mobile Cell Phones : A Case Study Analysis. Hawai: IEEE. http://dx.doi.org/10.1109/HICSS.2004.1265678

Rogers, E. (2003). *Diffusion of innovations.* New York: The Free Press .

Sheskin, D. J. (2000). *Handbook of Parametric and Nonparametric Statistical Procedure.* Florida: Chapman & Hall.

Velte, A. T., Velte, T. J., & Elsenpeter, R. (2010). *Cloud Computing : A Practical Approach.* United States: McGraw-Hill.

Zikmund, W. G., Babin, B. J., Carr, J. C., & Griffin, M. (2009). *Business Research Methods, 8th Edition.*

Zissis, D., & Lekkas, D. (2011). Addressing cloud computing security issues. *Future Generation Computer Systems* , 583-592. http://dx.doi.org/10.1016/j.future.2010.12.006,

Table 1. KMO and Bartlet Test for sample adequacy

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.758
Bartlett's Test of Sphericity	Approx. Chi-Square	1631.091
	df	120
	Sig.	.000

Table 2.Factor of extractions result

Survey Point	Factor	Correlation Coefficent
I need Cloud Computing technology	Need	0.921
Technology maintenance ost of Cloud Computing is cheaper	Cost	0.904
I'm sure the technology of Cloud Computing is more secure than conventional computers system	Security	0.884
Technology of Cloud Computing is technology of reliable clearly	Reliability	0.779

Table 3. Need and recommendation

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	21.214	4	5.304	12.197	.000
Within Groups	44.786	103	.435		
Total	66.000	107			

Table 4. Cost and recommendation

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	18.200	3	6.067	13.199	.000
Within Groups	47.800	104	.460		
Total	66.000	107			

Table 5. Security and recommendation

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	24.900	4	6.225	15.600	.000
Within Groups	41.100	103	.399		
Total	66.000	107			

Table 6. Realibility and recommendation

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	22.254	4	5.564	13.100	.000
Within Groups	43.746	103	.425		
Total	66.000	107			